purchases investigated in the diary study, different options for these changes were compared. The highest change for a meat or vegetable purchase is caused by a renunciation of fresh products flown in from oversees. A second important option, is a preference for organic products.

The modular LCA, which has been developed in this thesis (JUNGBLUTH et al., 2000), points-up the importance of different product characteristics. The method makes it possible to assess "environmental behaviour" of persons based on information about their consumption patterns. The LCA approach is simplified if a range of similar products is investigated and if knowledge of LCA studies can be used to identify hot spots and main inputs to the life cycle. Some of the results have been made available on www.ulme.uns.umnw.ethz.ch in order to enable consumers to evaluate the environmental impacts of their food purchases.

This book is of interest for all people working on the ecological assessment of food products, those dealing with the environmental impacts of consumption patterns or the decision-making situation of consumers. The thesis and a data annex can be downloaded free of charge at: http://www.uns.umnw.ethz.ch/~jungblu/dis.html. A hardcopy of this thesis is available for EUR 25.00 from the author Niels Jungbluth, ESU-services, Zentralstrasse 8, CH - 8610 Uster, T: +41 1 940 61 32, F: +41 1 940 61 94, email: jungbluth@gmx.net.

Niels Jungbluth, Umweltfolgen des Nahrungsmittelkonsums: Beurteilung von Produktmerkmalen auf Grundlage einer modularen Ökobilanz. Februar 2000, 317 Seiten, Dissertation ETH Nr. 13499, Umweltnatur- und Umweltsozialwissenschaften, Eidgenössische Technische Hochschule Zürich, ISBN 3-89825-045-8, dissertation.de, Berlin.

New LCA Theses

Development of a Multicriteria Decision Support System for Integrated Technique Assessment

In recent years environmental policy has changed from focusing on single environmental media towards integrated pollution prevention and control, taking into account all environmental media. For this reason, the necessity to control the relevant mass and energy flows becomes more and more important. Because the implementation of new techniques has effects on the whole process of industrial production, an isolated consideration of single emission reduction techniques is no longer sufficient. Rather an integrated approach should be pursued which also considers possible conflicts between economic, technical and ecological criteria. Appropriate methods for integrated technique assessment, however, are still in their initial stages.

The objective of this research work is therefore to demonstrate the benefits of a **multicriteria decision support system** for integrated technique assessment, **considering technical, economic and ecological criteria**, and its application to the iron and steel making industry.

In the first Chapters, a concise survey on the technical and economic preconditions as well as of the environmental legislation for iron and steel production in Germany and Europe is given. Special emphasis is put on the analysis of the latest development in Environmental Policy in the EU towards integrated pollution prevention and control.

A comprehensive analysis of the currently discussed methods for Life Cycle Assessment (LCA) with regard to integrated technique assessments concludes that LCA can only point out mass and energy flows with high ecological priority. Another shortcoming has to be seen in the lack of a systematic consideration of technical and economic criteria.

Therefore, a concept for an **integrated approach for technique assessment** has been elaborated, based on MCDM methods (MCDM = Multi Criteria Decision Making) for the simultaneous evaluation of the decisive ecological, technical and economic criteria. The preconditions for MCDM and the different approaches are explained with regard to the special requirements for integrated technique assessment.

The methodological core of the research work is the chapter on the enhancement of the outranking-method PROMETHEE which is a specific MCDM method. PROMETHEE proves to be a suitable approach for the integrated technique assessment thanks to its flexible algorithm. This allows tailor-made enhancements to meet specific requirements for an integrated technique assessment. Fuzzy-logic approaches are integrated into the PROMETHEE algorithm for the evaluation of vague scores and weighting factors. This allows a far-reaching utilisation of the limited available information from both an ecological evaluation and a process simulation of innovative techniques for emission reduction. In addition, a graphical sensitivity analysis is introduced for the outranking-method PROMETHEE which shows the limits of the derived results.

The multi criteria decision support system is applied to two case studies from the iron and steel making industry for the determination of Best Available Techniques (BAT), which are to be identified for numerous industrial installations as required by the European Directive on Integrated Pollution Prevention and Control (IPPC-Directive 96/71/EC), and for company internal preparation of investment decisions, where results from process simulations form the base of information. Thus, decision makers in industry and policy are able to analyse innovative emission reduction techniques at an early stage of planning.

The research work gives a broad overview on the current state of technique assessment, on the interrelations between environmental policy, techno-economic and environmental conditions, and on decision theory.

Jutta Geldermann, Entwicklung eines multikriteriellen Entscheidungsunterstützungssystems zur integrierten Technikbewertung. Fortschritt-Berichte VDI, Reihe 16 (Technik und Wirtschaft), Nr. 105, Düsseldorf (1999). ISBN: 3-18-310516-0. 223 pages, numerous Figures and Tables, DM 134;-- (special discount rates)